Electromagnetic Radiation Worksheet

Solve the following problems. Show all your work on a separate sheet of paper, round your answers to the correct number of significant figures, and include units in your answers.

1. What is the frequency in hertz of blue light having a wavelength of 425 nm?

2. A certain substance strongly absorbs infrared light having a wavelength of 6.50μm. What is the frequency in hertz of this light?

3. Ozone protects the earth's inhabitants from the harmful effects of ultraviolet light arriving from the sun. This shielding is a maximum for UV light having a wavelength of 295 nm. What is the frequency of this light?

4. Radar signals are electromagnetic radiation in the microwave region of the spectrum. Typical radar has a wavelength of 3.19 cm. What is the frequency in hertz?

5. In Memphis, "The Pig" AM 1210 broadcasts it AM signal at a frequency of 1210 kilohertz (kHz). What is the wavelength of this signal in meters?

6. Sodium vapor lamps are often used in residential street lighting. They give off a yellow light having a frequency of 5.09×10^{14}Hz. What is the wavelength of this light in nanometers?

7. How is the frequency of a particular type of radiation related to the energy associated with it? (Give an equation, defining all symbols)

8. Examine each of the following pairs of radiation types and circle the form from each pair that has the higher energy.

   a) Microwaves and infrared b) visible light and infrared

   c) ultraviolet light and X rays d) visible light and ultraviolet light

9. Calculate the energy (E) in joules of a photon of red light that has a frequency of 4.0×10^{14} Hz. ($E = h\nu$, where $h = 6.63 \times 10^{-34}$Js)

10. Calculate the energy in joules of a photon of green light having a wavelength of 550 nm. ($E = h\nu$, where $h = 6.63 \times 10^{-34}$Js)

1. $\upsilon = 7.06 \times 10^{14} Hz$
2. $\upsilon = 4.62 \times 10^{13} Hz$
3. $\upsilon = 1.02 \times 10^{15} Hz$
4. $\upsilon = 9.40 \times 10^{9} Hz$
5. $\lambda = 247.9 m$
6. $\lambda = 5.89 \times 10^{3} nm$
7. $\upsilon = \frac{E}{h}$

   E= Energy

   H= Plank's constant

   $\upsilon = Frequency$
8. *A. Infrared*

   B. Visible light

   C. X rays

   D. Ultraviolet light
9. $E = 2.65 \times 10^{-19} J$
10. $E = 1.09 \times 10^{-31} J$